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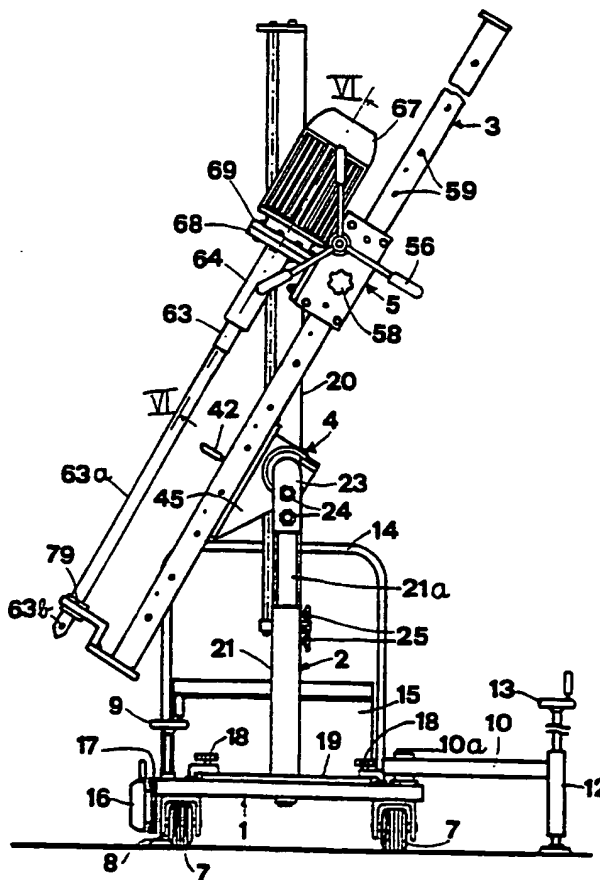
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(54) Title: DRILL PARTICULARLY FOR DRILLING MASONRY WALLS TO BE RENOVATED

(57) Abstract

A drill particularly suitable for drilling masonry structures to be renovated, which comprises a base (1), a supporting frame (2) which rises from the base (1), at least one sliding guide (3) supported by the frame (2) so that it can be oriented about a transverse axis, at least one slider (5) which is movably mounted on the sliding guide or guides (3), and at least one motorized head (6) for one or more drill bits.



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DRILL PARTICULARLY FOR DRILLING MASONRY WALLS TO BE
RENOVATED

Technical field

The present invention relates to a drill particularly suitable for producing holes in masonry walls to be renovated.

Background art

A method for stopping humidity rising along walls is known which consists in producing a plurality of holes or recesses in appropriately selected locations in the masonry affected by permanent humidity, both in underground floors and at levels above the roadway or the plane of site, and in inserting a treated metal bar in these holes or recesses. The provision of these bar seating holes is usually anything but easy with currently commercially available equipment, also because these holes must often be made diagonally or, more generally, with a non-horizontal inclination, so that it is necessary to be able to variously orientate the drill with respect to the vertical.

Disclosure of the Invention

An object of the present invention is to provide a drill which allows to produce holes which have any required inclination with respect to the vertical and has a solid and sturdy structure so as to keep stable the drilling head or heads during work, in order to minimize oscillations and vibrations which, if uncontrolled, can compromise and shorten the life of the drilling bits.

Another object of the present invention is that said drill is practical to be transported and to be used and can be manufactured at very low costs.

This aim, these objects and others which will become apparent hereinafter are achieved by a drill particularly suitable for drilling masonry structures to be renovated, which comprises a base, a supporting frame rising from the base, at least one sliding guide supported by the frame so that it can be orientated about a transverse axis, at least one slider which is movably mounted on the sliding guide or guides and at least one motorized head for one or more drill bits.

Advantageously, a flange or a pivoting ring for the orientation of the frame about an axis which is normal to the base is provided between the base and the frame.

Brief description of the drawings

The invention is described further hereinafter with reference to the accompanying drawings, wherein:

figure 1 is a lateral elevation view of a drill according to the invention;

figure 2 is a view similar to that of figure 1, but taken from the opposite side;

figure 3 is a partial sectional view, taken along the plane III-III of figure 2;

figure 4 is a sectional view, taken along the plane V-V of figure 2;

figure 5 is a different embodiment of figure 4;

figure 6 is a view of a drilling head, half of which is shown in a cross-section taken along the plane VI-VI of figure 1;

figure 7 is a top view of a drilling head with two drilling bits;

figure 8 is a view of a further embodiment of the

supporting frame;

figure 9 is a view of a further embodiment of the base; and

figure 10 is a view of a different embodiment of figure 9.

Ways of carrying out the invention

In the above figures, identical or similar parts or components have been designated by the same reference numerals.

As can be noted by inspecting the drawings, a drill according to the present invention is essentially constituted by a base 1, by a frame 2 rising from the base, by a pair of parallel sliding guides 3 which are supported so that they can be orientated about a cross-member 4 of the frame, a slider or carriage 5 which is mounted so that it can move along the guides 3, and a motorized head 6 for one or more drilling bits.

The base 1 is advantageously mounted on rolling wheels to easily move the drill from one drilling position to another. The wheels 7 can be of the fixed type, or at least two of them can be orientated. The base 1 can be constituted by a rigid metal platform which has, at the front of the machine, a pair of feet 8 which can be lowered and raised and can be actuated by a respective handwheel 9, whereas it has, at the rear part of the drill, one end of a pair of cantilever arms 10 which are pivoted in 10a; the other end of said arms has a foot 12 which can be lowered and raised and can be actuated by a respective handwheel 13. The arms 10 can be arranged in operating position by turning them so that they protrude from the platform 1,

where the feet 12 are lowered, so as to enlarge the base polygon of the machine during drilling operations, and can be moved to the inactive position in alignment with the adjacent edge of the platform, which for this purpose can
5 be provided with a recess (not visible in the drawings) for accommodating the feet 12.

On one side of the platform 1 it is advantageously possible to provide a handgrip 14 for easily pushing or pulling the machine to move it into the required position.
10 Next to the handgrip 14 it is possible to provide a toolbox 15. At the front of the machine, above it or in a cantilevered position, it is possible to provide counterweights 16 which can be removably inserted and extracted from respective accommodation brackets or seats
15 17.

In the central region of the platform it is possible to provide fixing means, constituted for example by four clamps 18, for a supporting flange 19 for the frame 2. Said frame can be constituted by two spaced uprights 20 and 21,
20 for example a long one and a short one (figures 1 to 3) which are fixed to the platform 1. The cross-member 4 extends between the uprights 20 and 21 and has an L-shaped end which, by means of clamps or pins 24, can be inserted in, and anchored to, the telescopic end 21a of the short
25 upright, kept in position by clamps or pins 25; the other end is flanged at 26 in order to couple to the corresponding flange 27 of a lockable sleeve 28 which is mounted around the long upright 20. The sleeve 28 (figure
3) is composed of two parts: a part 29, which surrounds
30 three quarters of the upright 20 and is provided with

terminal lugs 31 and 32, and another part 30 which affects only a quarter of the circumference of the upright 20 and is also provided with terminal lugs, respectively 34 and 35.

5 The lugs 32 and 34 can be kept locked by one or more bolts 36, whereas the lugs 31 and 35 are kept mutually spaced by a bridge-like element 37 which is bolted thereto. A passage 38 remains delimited between the lugs 31 and 35 and between the upright 20 and the element 37; a rack 39
10 which extends along the upright 20 can pass through said passage in the region adjacent to the upright, whereas a pinion 40 is seated in its region adjacent to the element 37, meshes with the rack 39 and is keyed on a transverse shaft 41 which is rotatably mounted in the lugs 31 and 35
15 and can be actuated by a spoked handwheel 42. By acting on the handwheel 42 (after loosening the clamps 25) it is possible to adjust the height of the cross-member 4 on the upright 20.

 The cross-member 4 supports a bracket 45 by means of a
20 pair of clamps 46 and 47 which are provided with tightening bolts 48, in order to allow the bracket 45 to be orientated about the axis of the cross-member 4, so as to assume any desired inclination with respect to the vertical.

 The straight sliding guides 3 are supported on the
25 plate 45 and fixed thereto, and are constituted for example by two identical tubular elements with a square opening, along which the carriage 5 can slide (figures 4 and 5). A rack 50 extends between the two guides 5 and can be welded between the two guides to constitute a stiffening element
30 between them. The carriage 5 is provided with pairs of

sliding rollers 51, which are arranged on the opposite side with respect to the guides 3, and with a pinion 52 which is keyed on a shaft which is rotatably supported by the sides 54 of the carriage. At one end, the shaft 53 protrudes from
5 the carriage and ends with a spoked actuation handwheel 56. By actuating the handwheel 56 in one direction or the other, the carriage is moved along the guides 3.

The carriage 5 can be locked in position, for example by means of a pin or a pair of pins 57, preferably spring-loaded and actuatable by means of a respective knob 58. For
10 this purpose, the guides 3 have, along their outer sides, a sequence of spaced holes 59 for engaging and accommodating the pins 57. The shaft 53 can be prevented from rotating by the block formed by a terminal clamp 55 which can be
15 actuated by a knob 55a.

Figure 5 is a view of a variated embodiment of figure 4, which provides for an actuation unit which comprises a motor 60 and a worm-screw reduction unit 61 and is applied to a side of the carriage 5, so as to engage an end of the
20 shaft 53 and make it rotate; the other end of the shaft 53 is connected to a control encoder 62.

The head 6 is constituted by a hollow chuck 63, which is rotatably mounted within a sleeve 64 with conical bearings 65 interposed (figure 6), and by a motor 67 the
25 output shaft whereof rotates rigidly with the chuck 63. More particularly, the sleeve 64 has a flanged end 68 which is fixed (for example by means of bolts which pass through peripheral axial holes 68a) at the head of the motor 67, which for this purpose is provided with a terminal coupling
30 flange 69, whereas the chuck 63 protrudes from its other

end. An annular interspace 70 is left between the sleeve 64 and the chuck 63 and is connected, by means of an internal hole 71 formed in the wall of the chuck 63, to the internal opening of said chuck; through an external hole 72 formed in the sleeve, said interspace can be supplied with liquid, usually water, by means of a coupling 73 which can be connected to a feed duct (not shown) which is connected to a source of pressurized fluid, such as pressurized water supplied by a pump. In order to prevent liquid leakages, annular sliding gaskets 74 are provided upstream and downstream of the holes 71 and 72. Two coupling and supporting brackets 75 are also fixed to the flange 68 and are provided with recesses 76 for positioning and anchoring them to the carriage 5.

The protruding end of the chuck 63 has an internally threaded portion 78 for the screw coupling of a hollow bit 63a of any suitable kind, provided with a terminal hole or holes 63b, which in addition to receiving a rotary working motion imparted by the chuck 63, which can be rotationally actuated by the motor 67, is also axially supplied with pressurized liquid arriving from the chamber 71 through the chuck.

Advantageously, at the nearest end of the guides 3 there is a supporting eyelet 79 for the bit 63a to reduce any skidding and vibrations, especially when drilling begins.

Figure 7 illustrates a different embodiment, in which the carriage 5 supports a cross-member 80 on which two fully identical motorized heads 6 are mounted; said heads allow to produce two holes simultaneously. Advantageously,

the two heads 6 can be made to rotate in mutually opposite directions and can mount reverse-helix bits for greater stability of the assembly and can be arranged at an adjustable distance from one another.

5 In the different embodiment of figure 8, the uprights 20 and 21 have the same height and the cross-member 4 is anchored thereto by means of two lockable sleeves 28 which can be locked by means of an eccentric element 81 which can be actuated by a lever 82 and is possibly loaded
10 by a spring 83 which is accommodated in two appropriate holes formed in the lugs 32 and 34. The shaft 41 extends from a sleeve which can be secured to the other one; on one side it can be actuated by a gearmotor unit 85 and on the other side it is provided with an encoder 86. Two pinions
15 40, one for each sleeve, are keyed on the shaft 41 and mesh with a respective rack 39.

 The bracket 45 is mounted on a sleeve 87 which is rotatably mounted on the cross-member 4 and has at least one flanged end 89 to which a ring gear 90 is laterally
20 adjacent and fixed; said ring gear meshes with a pinion 91 which can be actuated by a gearmotor 92 which is supported by the flange 27 of the adjacent lockable sleeve 28. With this arrangement, both the ascending and descending movements of the cross-member 4 along the uprights 20 and
25 21 and the movement for the orientation of the bracket 45, and thus of the bit, with respect to the vertical become automatic.

 Figure 9 illustrates a different embodiment in which the base 1 is mounted on axles 93 which are provided with
30 end wheels 94 for rails 95. At least one axle is provided

with a gearmotor unit 96 for travel along the rails 95. The flange 19 is mounted on a pivoting ring 97 which can be actuated by a motor 98, so as to also automate the orientation of the uprights 20 and 21 with respect to the masonry to be renovated.

If required, the axles 93 can be provided, at their ends, with a rocker 99 (figure 10) which is freely mounted on the respective axle and has a wheel 94 at one end and a wheel 7 at the other end. The rocker can be arranged in the position shown in the figure and be kept locked in this position for example by means of a pin 100 which can be inserted in a lug 101 of the base and in an appropriate hole 102 of the rocker, so that ground resting is performed with tire-fitted wheels 7 or, in the opposite configuration, with rail wheels 94.

For the motorized axle or axles adjacent to one or both of the rockers 99 there is a twin wheel for a chain or a double pulley 103 which is kinematically connected by means of a chain or belt 104 both to the wheel 7 and to the wheel 94 which are supported by the rocker.

The operation of the above described drill, in view of what has already been specified, is easily and immediately understandable. Once the or each bit 63a has been mounted on the chuck 63, the cross-member 4 is moved to the required height by acting on the handwheel 42 and loosening the clamps 25 or by activating the gearmotor unit 85. Then, by loosening and tightening the bolts 48, or by making the gearmotor unit 92 act, the appropriate inclination is given to the bracket 45 and thus to the guides 3 with respect to the vertical.

Current is then supplied to the motor or motors 67 for actuating the bit or bits 63a and by acting on the handwheel 56 or by causing the intervention of the motor unit 60 and of the reduction unit 61, the forward movement of the bit or bits 63a in the masonry to be treated is ensured. At the same time, pressurized liquid is fed continuously or intermittently to the chamber 70 and thus to the tip of the bit; this liquid has the purpose of cooling the bit and of removing the material removed thereby to discharge it outside, making it rise between the bit and the wall of the hole which it has formed.

With a drill according to the invention it is possible to produce non-horizontal transverse holes, even in very thick walls, which can reach a length of a few meters within a few minutes.

By way of indication, in walls made of relatively soft material (made for example of bricks) for holes measuring 1.30 m, 1.50 m and 2.00 m, drilling times may vary respectively between 30 seconds and 1 minute 30 seconds, between 35 seconds and 2 minutes, and between 2 and 3 minutes; in walls made of hard material, such as those made of black stone, for holes of the above lengths drilling times can be respectively 3 to 4 minutes and 10 to 15 minutes.

The invention as described above is susceptible to numerous modifications and variations within the protective scope defined by the content of the following claims.

Thus, for example, the drill can comprise a computerized control unit to operate according to a program in a fully automatic manner.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such
5 reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

CLAIMS

1 1. Drill, particularly suitable for drilling masonry
2 structures to be renovated, comprising a base, a supporting
3 frame which rises from the base, at least one sliding guide
4 supported by the frame so that it can be orientated about a
5 transverse axis, at least one slider which is movably
6 mounted on the sliding guide or guides and at least one
7 motorized head for one or more drill bits.

1 2. Drill according to claim 1, further comprising a
2 flange or a pivoting ring between the base and the frame to
3 orientate the frame about an axis at right angles to the
4 base.

1 3. Drill according to claim 2, further comprising
2 automatic control and motor means for the orientation of
3 the frame on the base.

1 4. Drill according to claim 1, characterized in that
2 said supporting frame comprises two substantially parallel
3 uprights, a cross-member supported by the uprights and a
4 bracket or ledge which is arranged so that it can be
5 orientated on the cross-member and is meant to support the
6 or each sliding guide.

1 5. Drill according to claim 4, further comprising
2 sliding means for positioning the cross-member on the
3 uprights at an adjustable height.

1 6. Drill according to claim 5, characterized in that
2 at least one of the uprights supports a longitudinal rack
3 and that the cross-member is provided with a pinion, or
4 with a respective pinion, which meshes with the rack or
5 with the respective rack and can be actuated by actuation

6 means.

1 7. Drill according to claim 6, characterized in that
2 the pinion, or each pinion, is rotatably mounted within a
3 lockable sleeve for anchoring an end of the cross-member to
4 the upright with adjacent rack.

1 8. Drill according to claim 6, characterized in that
2 said actuation means comprise an actuation handwheel for an
3 actuation shaft on which the pinion, or each pinion, is
4 keyed.

1 9. Drill according to claim 6, characterized in that
2 said actuation means comprise a gearmotor unit and driving
3 sensor means.

1 10. Drill according to claim 9, characterized in that
2 said driving sensor means comprise an encoder.

1 11. Drill according to claim 4, characterized in that
2 one of the uprights is shorter than the other and is
3 telescopic.

1 12. Drill according to claim 4, characterized in that
2 the bracket or ledge is mounted so that it can be
3 orientated about the axis of the cross-member.

1 13. Drill according to claim 12, further comprising a
2 gearmotor unit to actuate the automatic orientation of the
3 bracket or ledge about the axis of the cross-member.

1 14. Drill according to claim 13, further comprising a
2 flanged sleeve which is rotatably mounted on the cross-
3 member, at least one ring gear which rotates rigidly with a
4 respective flange of the flanged sleeve and a pinion which
5 meshes with the ring gear and is kinematically connected to
6 the gearmotor unit.

1 15. Drill according to claim 1, characterized in that

2 the slider, or each slider, comprises a carriage or sliding
3 block which is provided with actuation means to move it
4 along the guide or guides.

1 16. Drill according to claim 15, characterized in that
2 said actuation means comprise a rack arranged parallel to
3 the guides and rigidly coupled thereto, a pinion which is
4 rotatably mounted on the carriage or sliding block for
5 meshing with the rack, and actuation means for the pinion.

1 17. Drill according to claim 16, characterized in that
2 said actuation means comprise a handwheel for the manual
3 actuation of the carriage or sliding block.

1 18. Drill according to claim 16, characterized in that
2 said actuation means comprise a gearmotor which can be
3 controlled by means of an encoder for the automatic
4 actuation of the pinion.

1 19. Drill according to claim 15, characterized in that
2 said carriage or sliding block comprises means for locking
3 in position along the guide or guides.

1 20. Drill according to claim 1, characterized in that
2 the, or each, motorized head comprises: a sleeve with a
3 flanged end; a hollow chuck, which is rotatably mounted
4 within the sleeve so as to delimit therewith an annular
5 interspace which is connected both to the internal opening
6 of the chuck and to a connection to a source of pressurized
7 fluid; means for forming a seal between the sleeve and the
8 chuck; an actuation motor for the chuck which is fixed to
9 the flanged end of the sleeve; and a hollow bit, with at
10 least one outlet hole at its tip, which can be applied to
11 the other end of the chuck, so that the latter can be
12 rotated by the chuck and be supplied with pressurized fluid

13 by the pressurized fluid source through said sealed annular
14 interspace.

1 21. Drill according to claim 20, characterized in that
2 said chuck is rotatably mounted in the sleeve by means of
3 conical bearings.

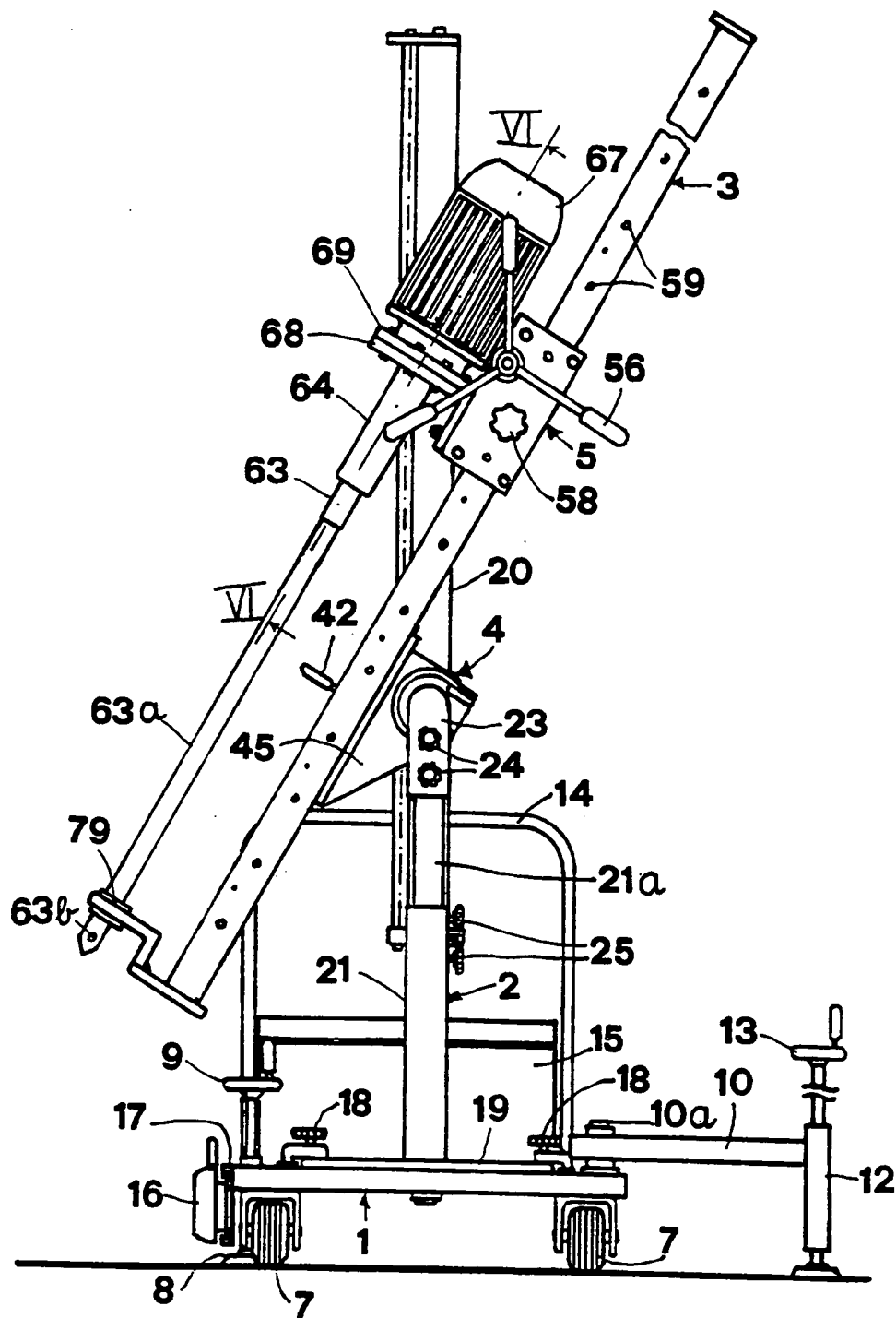


Fig. 1

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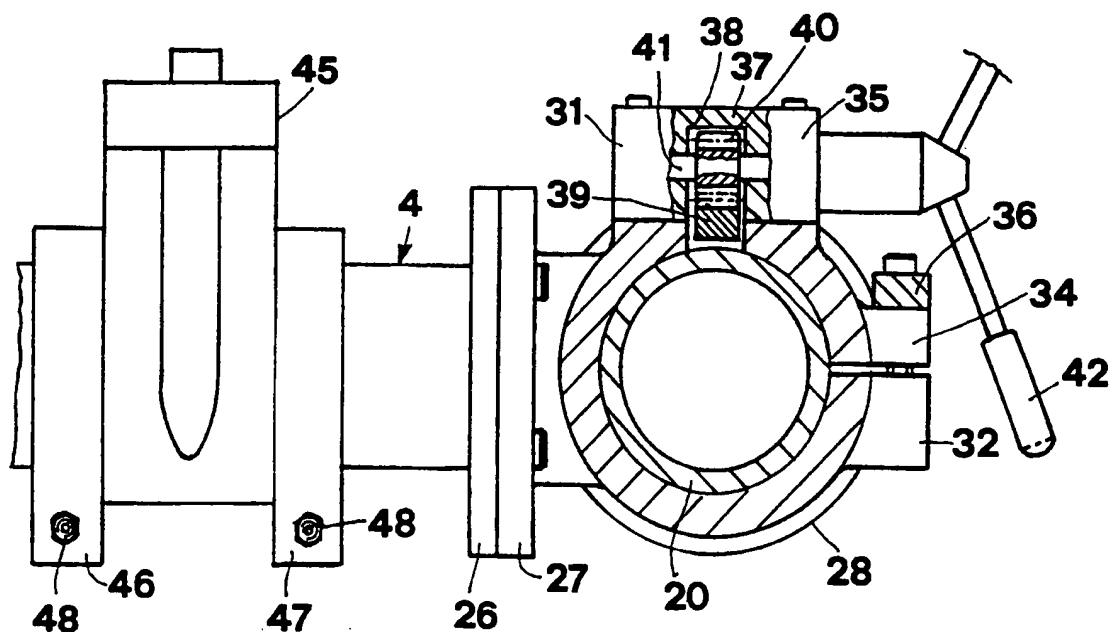


Fig. 3

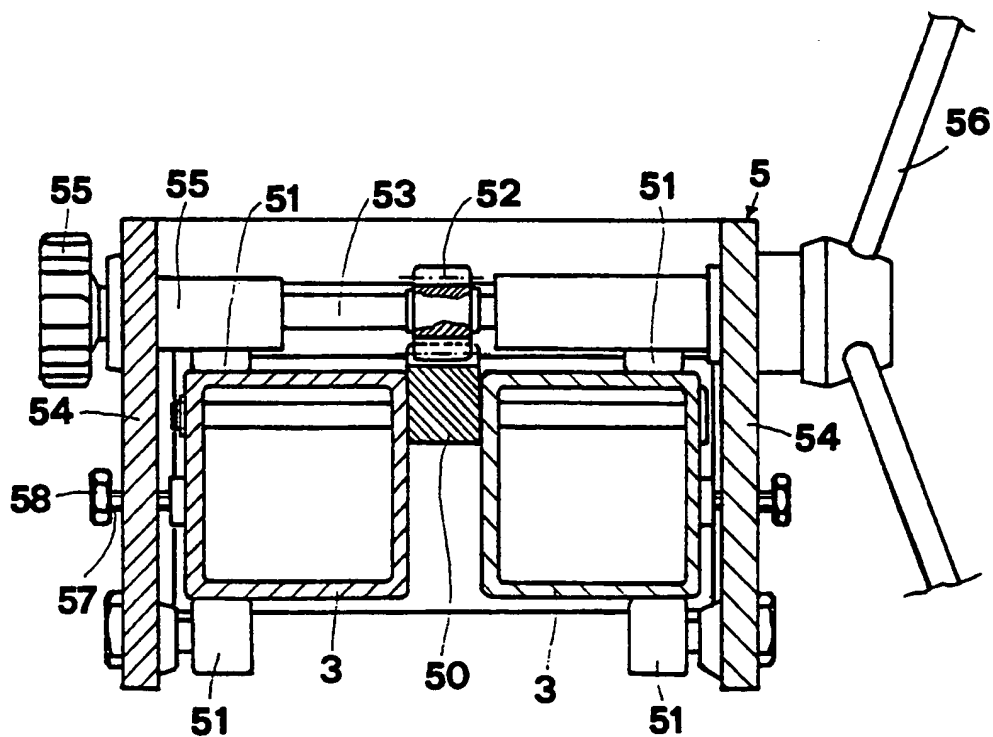
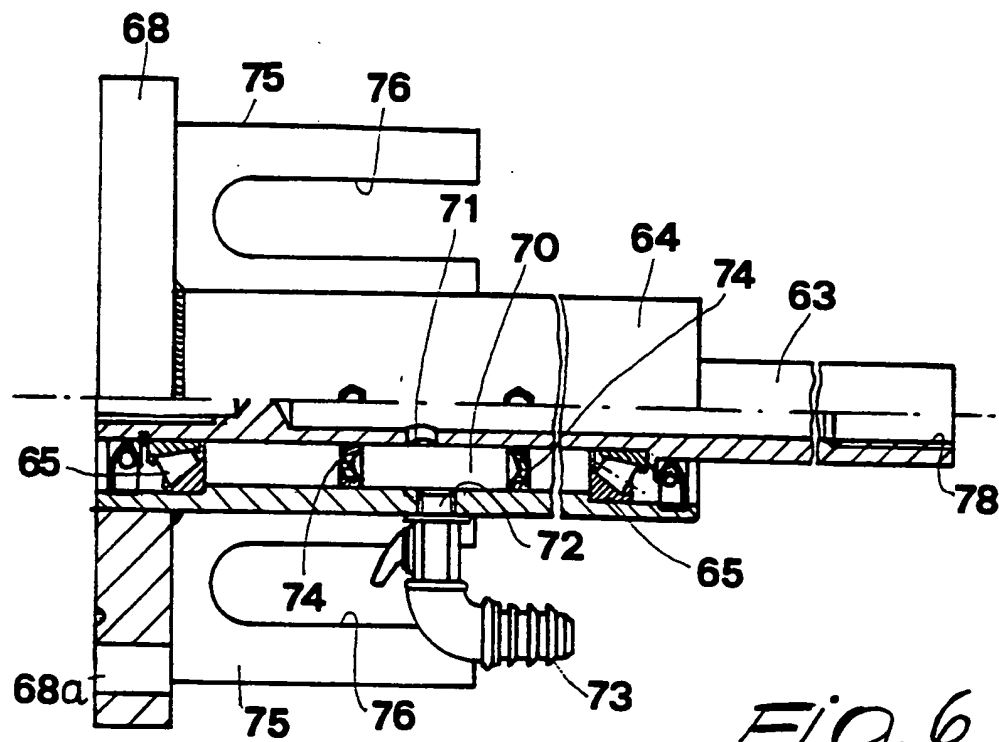
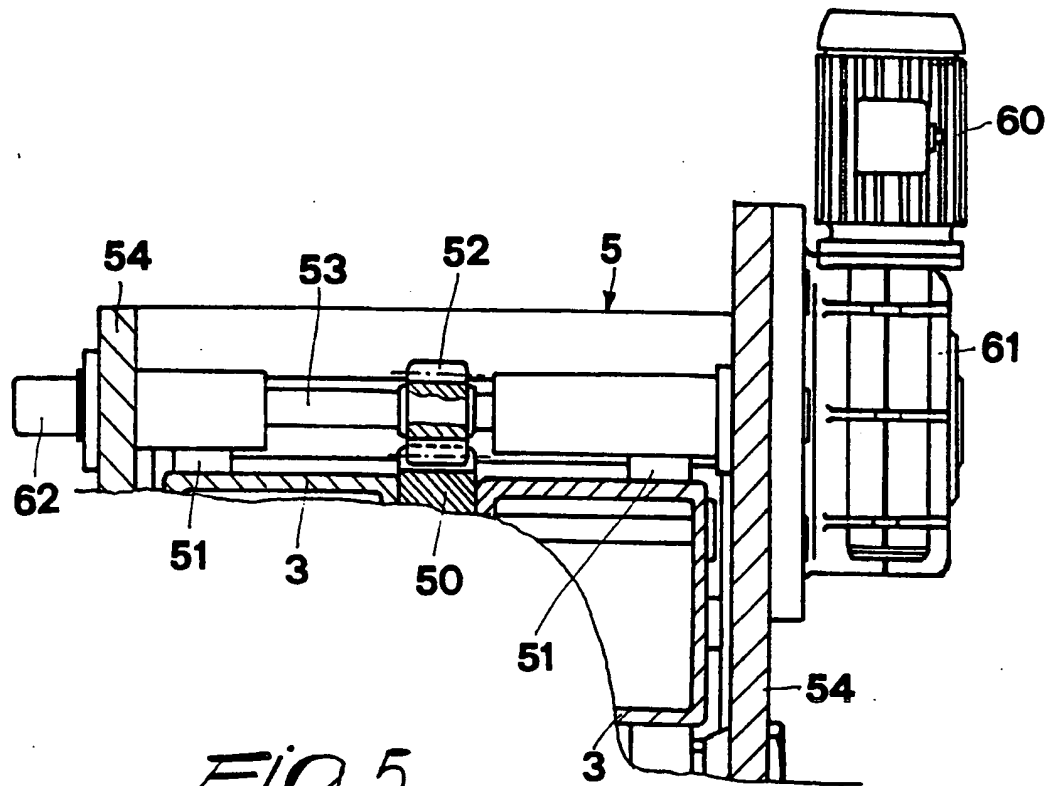
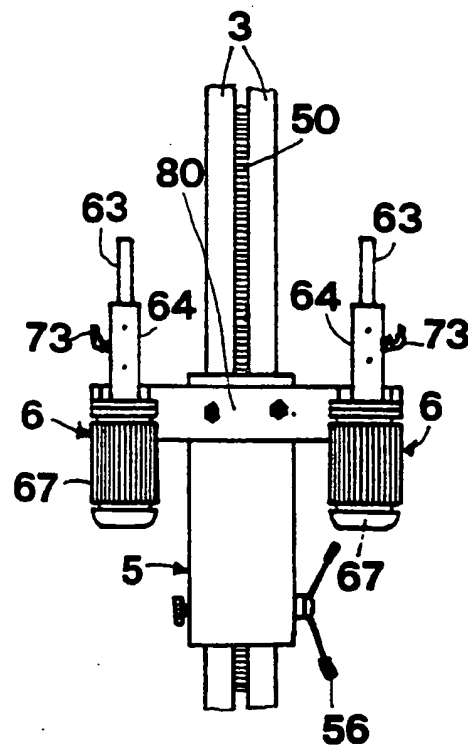


Fig. 4

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*Fig. 7*

INTERNATIONAL SEARCH REPORT

International Application No
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A. CLASSIFICATION OF SUBJECT MATTER
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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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